

**METHOD AND SYSTEM FOR AUTOMATICALLY DISPLAYING CONTENT
OF A WINDOW ON A DISPLAY THAT HAS CHANGED ORIENTATION**

Background of the Invention

5 Personal pocket devices are becoming increasingly popular. Display
screen rotation is becoming a common feature in many pocket devices. Display screen
rotation allows a user to change the orientation of a display screen from vertical (i.e.,
portrait) to horizontal (i.e., landscape), and vice versa. When the orientation of the
display screen is changed, content in a window, such as a dialog box, may not be
10 visible. Thus, the user may not be able to access the full window in the new orientation.
What is needed is a way to automatically display content of a window such that all of
the content may be accessed when the display screen orientation is changed.

Summary of the Invention

 The present invention is directed at a method and system for
15 automatically displaying content of a window on a display that has changed orientation.
The method comprises: locating the window on the display having a first orientation;
positioning the window such that a maximum portion of the window is visible on the
display having a second orientation; sizing the window such that the window is visible
on the display having the second orientation; determining if the window is entirely
20 visible on the display having the second orientation; and if not, adding a scrollbar to the
window such that the non-visible portions of the window are accessible.

 The system comprises an automatic window adjustment mechanism that
operates using shell and a window manager functions to automatically adjust window
size, orientation, and features when an orientation change is initiated. The shell
25 determines if the window is entirely visible in the new orientation. The shell positions
and sizes the window if the window is not entirely visible in the new orientation. The
window is positioned and sized to provide maximum visibility of the window in the
new orientation. The window manager adds a scrollbar to the window if the window is

not entirely visible in the new orientation after the window has been positioned and sized.

Brief Description of the Drawings

FIGURE 1 shows an exemplary computing environment in which the
5 present invention may be implemented.

FIGURE 2 illustrates a window that is visible within a display screen both before and after the display screen is changed from portrait to landscape in accordance with the present invention.

FIGURE 3 illustrates a window that is partially visible on the display
10 screen when the orientation of the display screen is changed from portrait to landscape, and a window that has been repositioned in accordance with the present invention.

FIGURE 4 illustrates a window that is not visible on the display screen when the orientation of the display screen is changed from portrait to landscape, and a window that has been repositioned in accordance with the present invention.

FIGURE 5 illustrates a full screen window that is partially visible on the
15 display screen when the orientation of the display screen is changed from portrait to landscape, and a window that has been resized and includes a scrollbar in accordance with the present invention.

FIGURE 6 illustrates a window that is not entirely visible on the display
20 screen when the orientation of the display screen is either portrait or landscape, and a window that has been resized and repositioned and includes a scrollbar in accordance with the present invention.

FIGURE 7 illustrates a window that is partially visible on the display
screen when the orientation of the display screen is portrait and that is not visible on the
25 display screen when the orientation of the display screen is landscape, and a window that has been resized and repositioned and includes a scrollbar in accordance with the present invention.

FIGURE 8 illustrates an exemplary functional block diagram of a system for automatically displaying content of a window on a display that has changed orientation in accordance with the present invention.

FIGURE 9 is an operational flow diagram illustrating a process for
5 automatically displaying content of a window on a display that has changed orientation in accordance with the present invention.

FIGURE 10 illustrates exemplary code for a mechanism to automatically display content of a window on a display that has changed orientation in accordance with the present invention.

10 Detailed Description of the Preferred Embodiment

Briefly stated, the present invention is directed to a method and system for automatically displaying content of a window on a display that has changed orientation. The content of a window, such as a dialog box, may have been authored for a particular size and position in a particular orientation (e.g., portrait). The present
15 invention provides for repositioning and resizing the window such that the window is viewable in its entirety when the display screen orientation is changed (e.g., from portrait to landscape.) A scroll bar may be added to allow full access to content that is not visible within the display screen. Likewise, the scrollbar may be removed if the scrollbar is no longer necessary in the new orientation. The repositioning/resizing of
20 the window, and addition/removal of the scrollbar occurs without interruption of other operating system applications.

Illustrative Operating Environment

With reference to FIGURE 1, one exemplary system for implementing
25 the invention includes a computing device, such as computing device 100. A basic configuration includes those components within dashed line 102. In the basic configuration, computing device 100 typically includes at least one processing unit 104 and system memory 106. Depending on the exact configuration and type of computing device, system memory 106 may be volatile (such as RAM), non-volatile (such as

ROM, flash memory, etc.) or some combination of the two. System memory 106 typically includes an operating system 108, one or more applications 110, and may include program data 112.

Computing device 100 may have additional features or functionality.

5 For example, computing device 100 may also include additional data storage devices (removable and/or non-removable) such as, for example, magnetic disks, optical disks, or a memory stick. Such additional storage is illustrated in FIGURE 1 by removable storage 114 and non-removable storage 116. Computer storage media may include volatile and non-volatile, removable and non-removable media implemented in any
10 method or technology for storage of information, such as computer readable instructions, data structures, program modules, or other data. System memory 106, removable storage 114 and non-removable storage 116 are all examples of computer storage media. Computer storage media includes, but is not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks
15 (DVD) or other optical storage, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired information and which can be accessed by computing device 100. Any such computer storage media may be part of device 100. Computing device 100 may also have input device(s) 118 such as keyboard, mouse, pen, voice input device, touch
20 input device, etc. Output device(s) 120 such as a display, speakers, printer, etc. may also be included. These devices are well know in the art and need not be discussed at length here.

Computing device 100 may also contain communication connections 122
that allow the device to communicate with other computing devices 124, such as over a
25 network. Communication connection 122 is one example of communication media. Communication media may typically be embodied by computer readable instructions, data structures, program modules, or other data in a modulated data signal, such as a carrier wave or other transport mechanism, and includes any information delivery media. By way of example, and not limitation, communication media includes wired
30 media such as a wired network or direct-wired connection, and wireless media such as

acoustic, RF, infrared and other wireless media. The term computer readable media as used herein includes both storage media and communication media.

Automatic Window Adjustment Mechanism

5 FIGURES 2-7 illustrate examples of windows that are in a particular position and of a particular size when an orientation change is initiated. The examples illustrated show a change from portrait to landscape. It is understood that the present invention may also be utilized for an orientation change from landscape to portrait without departing from the spirit or scope of the invention.

10 Each of FIGURES 2-7 illustrates an overlay of a portrait view (e.g., 210) and a landscape view (e.g., 220) of a display screen that includes a window (e.g., 200). The window's size and position within the overlay is also shown. The size and position of some of the windows in FIGURES 2-7 illustrate that in certain circumstances, the window is no longer fully visible after an orientation change.

15 Accordingly, FIGURES 2-7 also illustrate the new window size, position, and features as implemented by the present invention. The present invention automatically adjusts (as indicated by the large arrow) the size, position, and features of the original window (e.g., 200) to produce a new window (e.g., 230).

20 As may further be seen in FIGURES 2-7, certain windows depending on their size and position, may require the insertion of a scroll bar into the window for display of the content. FIGURES 2-4 illustrate windows whose size and position do not require the insertion of a scroll bar. Correspondingly, FIGURES 5-7 illustrate windows whose size and position require the insertion of a scroll bar.

25 FIGURE 2 illustrates a window that is visible within a display screen both before and after the display screen is changed from portrait to landscape. Window 200 is located in the upper portion of the display screen when the display screen has portrait orientation 210. Window 200 is located in the left portion of the display screen when the display screen has landscape orientation 220. Window 200 is completely visible in both display screen orientations 210, 220. Thus, no action is required to fit
30 window 200 in the display screen when the orientation has changed from landscape to

portrait. The present invention therefore does not adjust the window properties to obtain new window 230. New window 230 indicates that utilization of the present invention is not necessary to view the window in the new orientation.

FIGURE 3 illustrates a window that is partially visible on the display screen when the orientation of the display screen is changed from portrait to landscape. Window 300 is located in the middle portion of the display screen when the display screen has portrait orientation 310. The portion of window 300 above dashed line 320 is located in the lower left portion of the display screen when the display screen has landscape orientation 330. The portion of window 300 below dashed line 320 is not visible on the display screen when the display screen has landscape orientation 330. Thus, in accordance with the present invention, window 300 is repositioned within the display screen having landscape orientation 330 such that the entire window is visible. For example, window 300 can be repositioned to the location of window 340 as shown in the lower portion of FIGURE 3.

FIGURE 4 illustrates a window that is not visible on the display screen when the orientation of the display screen is changed from portrait to landscape. Window 400 is located in the lower portion of the display screen when the display screen has portrait orientation 410. Window 400 is not visible on the display screen when the display screen has landscape orientation 420. In order to allow user access to window 400, window 400 is repositioned to be located within the display screen having landscape orientation 420. For example, window 400 can be repositioned to the location of window 430 shown in the lower portion of FIGURE 4.

FIGURE 5 illustrates a full screen window that is partially visible on the display screen when the orientation of the display screen is changed from portrait to landscape. Window 500 essentially fills the entire display screen having portrait orientation 510. However, the portion of window 500 below dashed line 520 is not visible when the orientation of the display screen is changed to landscape orientation 530 because the height of the display screen is now smaller.

To allow user access to the hidden portion of window 500 when the display screen has a landscape orientation, window 500 is resized to take the shape of

window 540 as shown in lower portion of FIGURE 5. In accordance with the present invention, and vertical scrollbar 550 is added to window 540. Scrollbar 550 allows a user to access the portions of window 540 that are not immediately visible on the display screen.

5 FIGURE 6 illustrates a window that is not entirely visible on the display screen when the orientation of the display screen is either portrait or landscape. Window 600 does not fit within the display screen having portrait orientation 610. The portion of window 600 below dashed line 620 is not visible. Likewise, window 600 does not fit within the display screen having landscape orientation 630. The portion of
10 window 600 below dashed line 640 is not visible on the display screen. In order to allow full user access to window 600, window 600 is repositioned and resized to fit in the display screen having landscape orientation 640, and a scrollbar is added. For example, window 600 can be repositioned and resized to take the form of new window 650 (including scrollbar 660) as shown in the lower portion of FIGURE 6.

15 FIGURE 7 illustrates a window that is partially visible on the display screen when the orientation of the display screen is portrait and that is not visible on the display screen when the orientation of the display screen is landscape. Window 700 does not fit within the display screen having portrait orientation 710. The portion of window 700 below dashed line 720 is not visible. Likewise, window 700 is not visible
20 within the display screen having landscape orientation 730. In order to allow user access to window 700, window 700 is repositioned and resized to fit in the display screen having landscape orientation 730, and a scrollbar is added. For example, window 700 can be repositioned and resized to take the form of new window 740 (including scrollbar 750) as shown in the lower portion of FIGURE 7.

25 The present invention is described with reference to a change in display screen orientation from portrait to landscape, however it is understood that the system described can support any change in display screen orientation.

FIGURE 8 illustrates an exemplary functional block diagram of a system for automatically adjusting the size, orientation and features of window on a display
30 when an orientation change is initiated in accordance with the present invention. The

system includes display screen 800, shell 810, window manager 820, and auto window adjust module 830. Shell 810 and window manager 820 are components of operating system 840. Display screen 800 is the visible portion of a user interface. Auto window adjust module 830 is an application that provides the code for automatically displaying
5 content of a window on a display that has changed orientation.

Shell 810 includes heuristics to determine the rules applied by a window positioning application. The heuristics set forth the “look and feel” of display screen 800 when the orientation is changed. In another embodiment, the heuristics may be included in a different component of operating system 840.

10 Window manager 820 manages the viewable area of the window and the addition/removal of scrollbars on display screen 800. Window manager 820 controls the operation of the scrollbar when the user wants to scroll up or down a window in the new orientation.

Operating system 840 sends a notification to shell 810 when the
15 orientation of display screen 800 has changed. Shell 810 searches for all top-level windows in the new orientation. The search is performed by class such that all available top-level windows are enumerated. For example, top-level window 850 is located by shell 810.

In one embodiment, the top-level window restriction is removed such
20 that lower-level windows may be found. For example, if the window includes a nested window, the top-level window restriction is removed. A nested window is a window that resides within a window.

Shell 810 determines if window 850 is visible in the new orientation of display screen 800. If the entire window is visible in the new orientation, no action is
25 taken. If all or a portion of window 850 is not visible in the new orientation, shell 810 repositions and, if necessary, resizes window 850.

When window manager 820 receives a notification from shell 810 that a change in the orientation of display screen 800 is occurring, the dimensions of window 850 in the both the old and new orientations of display screen 800 are determined.
30 Before window 850 is repositioned and resized, an application program interface (API)

is called to determine the dimensions of the window. For example, shell 810 calls GetWindowRect in auto window adjust module 830 to enumerate the size of window 850.

5 Shell 810 repositions and resizes window 850 by calculating the visible area of display screen 800 in the new orientation. Window 850 can be resized to cover any portion of the area of display screen 800. In one embodiment, the repositioning and resizing occurs as a result of shell 810 calling a reposition/resize application from auto window adjust module 830. After the reposition/resize application is called, shell 810 requests the vertical height of the viewing area of window 850 from window manager 10 820. Shell 810 then determines the dimensions of a new window and forwards the new dimensions to window manager 820. Window manager 820 performs the appropriate resizing and repositioning calculations based on the location of window 850 and the orientation of display screen 800. The new window is then positioned within display screen 800 having the new orientation.

15 Shell 810 sends a scrollbar notification to window manager 820 if the new window requires a scrollbar. The scrollbar notification contains information about any limits of the viewing area on display screen 800. The scrollbar notification also controls the removal or addition of the scrollbar. Since the scrollbar notification is customized, the user may define the boundaries of the viewing area and window 20 manager 820 can scroll up or down to the desired location.

Shell 810 contains information about the viewable area of display screen 800 that the new window may be positioned within after the orientation change. The viewable area of display screen 800 is not a set parameter. In one embodiment, for a pocket computing device, the maximum available viewable space for window 850 is 25 slightly less than the dimensions of display screen 800 to allow room for a menu chrome. The menu chrome can include a task bar or other tools that are frequently accessed by the user. Shell 810 contains information about the contents and location of the menu chrome. Window 850 is usually not displayed where the menu chrome is located, but window 850 could obscure the menu chrome if desired. The

reposition/resize application provides flexibility such that window 850 may be resized to any desired dimension.

Shell 810 is an external component that original equipment manufacturers (OEMs) can customize to meet design specifications. Shell 810 is not
5 fixed as to menu chrome dimensions, which adds flexibility to the system. In one embodiment, no menu chrome is displayed. The present invention is described with reference to the shell of a pocket computing device, however it is understood that the system described can support many different shells.

An exemplary process for automatically displaying content of a window
10 on a display that has changed orientation is described with reference to FIGURE 9. The process begins at block 900 where the display screen is configured to have a certain orientation, such as landscape or portrait.

At block 905, a change in the orientation of the display screen is initiated. The change in orientation may be user-initiated or automatic. In one
15 embodiment, the change in orientation is from zero degrees to ninety degrees. In one example, the change in orientation of the display screen is from portrait to landscape. Processing moves to block 910. At block 910, the operating system notifies the shell that an orientation change has occurred. Processing then moves to block 915.

At block 915, the shell searches for a top-level window currently open
20 on the system. However, in one embodiment, other lower-level windows may be located. For example, in the case of nested windows, the top-level window restriction is removed. Processing proceeds to decision block 920.

At decision block 920, a determination is made whether the entire window is positioned within the display screen. If the entire window is positioned
25 within the display screen (as shown in FIGURE 2), the process flows to decision block 950. However, if any portion of the window is not positioned within the display screen, the process continues at block 925.

At block 925, the window is repositioned and resized to be visible within the limits of the display screen. As shown in FIGURES 3 and 4, only a
30 reposition is necessary if the entire window fits within the display screen after being

repositioned. Likewise, only a resize may be necessary. For example, as shown in FIGURE 5, the window is already positioned at the upper left corner of the display screen so a reposition is not necessary. When the orientation of the display screen changes from portrait to landscape, both a reposition and a resize are necessary when
5 the vertical length of the window is larger than the vertical width of the display screen, and the window is not located in the upper left corner of the display screen, as shown in FIGURES 6 and 7. When the orientation of the display screen changes from landscape to portrait, both a reposition and a resize are necessary when the horizontal length of the window is larger than the horizontal width of the display screen, and the window is not
10 located in the upper left corner of the display screen. Processing continues at decision block 930.

At decision block 930, a determination is made whether the entire window is positioned within the display screen. If the entire window is not positioned within the display screen the process flows to block 935. However, if the entire
15 window is positioned within the display screen, the process continues at decision block 940.

At block 935, a scrollbar is added to the window. The scrollbar allows a user to access portions of the window that are not immediately visible within the display screen. Processing then moves to decision block 950.

20 At decision block 940, a determination is made whether a scrollbar is present within the window. If a scrollbar is not present within the window, the process flows to decision block 950. However, if a scrollbar is present within the window, the process continues at block 945.

At block 945, the scrollbar is removed because it is unnecessary.
25 Referring to the lower portion of FIGURE 6, a window with a scrollbar is shown within a display screen having a landscape orientation. Changing the orientation to portrait would result in the configuration shown in the upper right portion of FIGURE 6. As shown in the diagram, the entire window is visible within the display screen. Thus, the scrollbar is not necessary for full display of the window content. Processing then
30 moves to decision block 950.

At decision block 950, a determination is made whether any more windows are open. If a window is open that requires repositioning/resizing or the addition/removal of a scrollbar, the process returns to block 915 to repeat the process. If no open windows exist, processing ends at block 955.

5 FIGURE 10 illustrates exemplary code for a mechanism to automatically display content of a window on a display that has changed orientation in accordance with the present invention. A command to find a window that requires resizing and/or repositioning is executed (e.g., 1000). The window manager receives the window to be resized and/or repositioned (e.g., 1010). A determination is made whether a scroll bar
10 should be added (e.g., 1020). The size of the window is determined (e.g., 1030). A pointer is positioned at the window (e.g., 1040). The size of the window is then changed. In the example shown, the size of the window is made smaller by 80 pixels (e.g., 1050). A scrollbar may then be added (e.g., 1060).

 The above specification, examples and data provide a complete
15 description of the manufacture and use of the composition of the invention. Since many embodiments of the invention can be made without departing from the spirit and scope of the invention, the invention resides in the claims hereinafter appended.